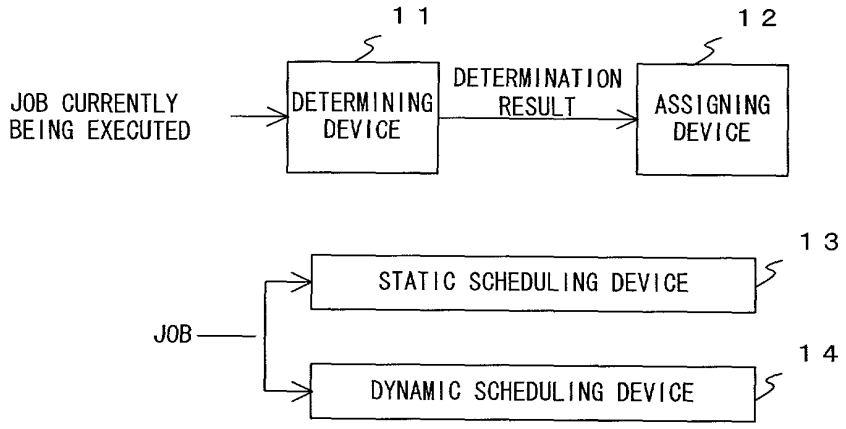
11
12
JOB CURRENTLY BEING EXECUTED
DETERMINING DEVICE
DETERMINATION RESULT
ASSIGNING DEVICE
13
STATIC SCHEDULING DEVICE
JOB
14
DYNAMIC SCHEDULING DEVICE

FIG. 1

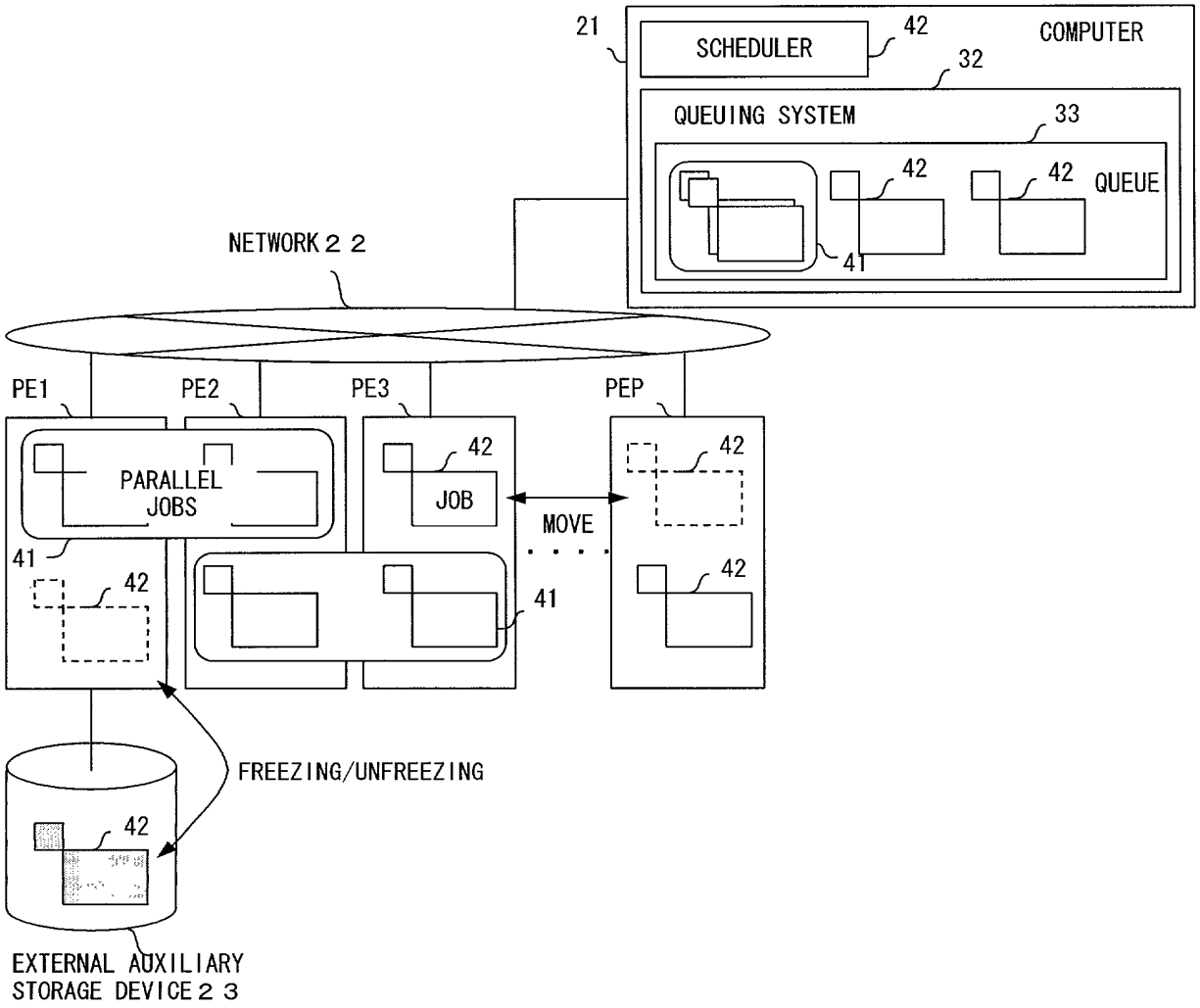
21
SCHEDULER
42
COMPUTER
32
QUEUING SYSTEM
33
42
42
QUEUE
41
NETWORK 2 2
PE1
PE2
PE3
PEP
PARALLEL JOBS
41
42
42
JOB
MOVE
42
41
42
FREEZING/UNFREEZING
42
EXTERNAL AUXILIARY STORAGE DEVICE 2 3

FIG. 2

EXPRESS MAIL NO. EL 533 060 205 US

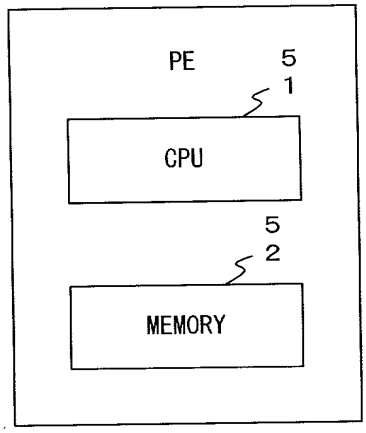

FIG. 3

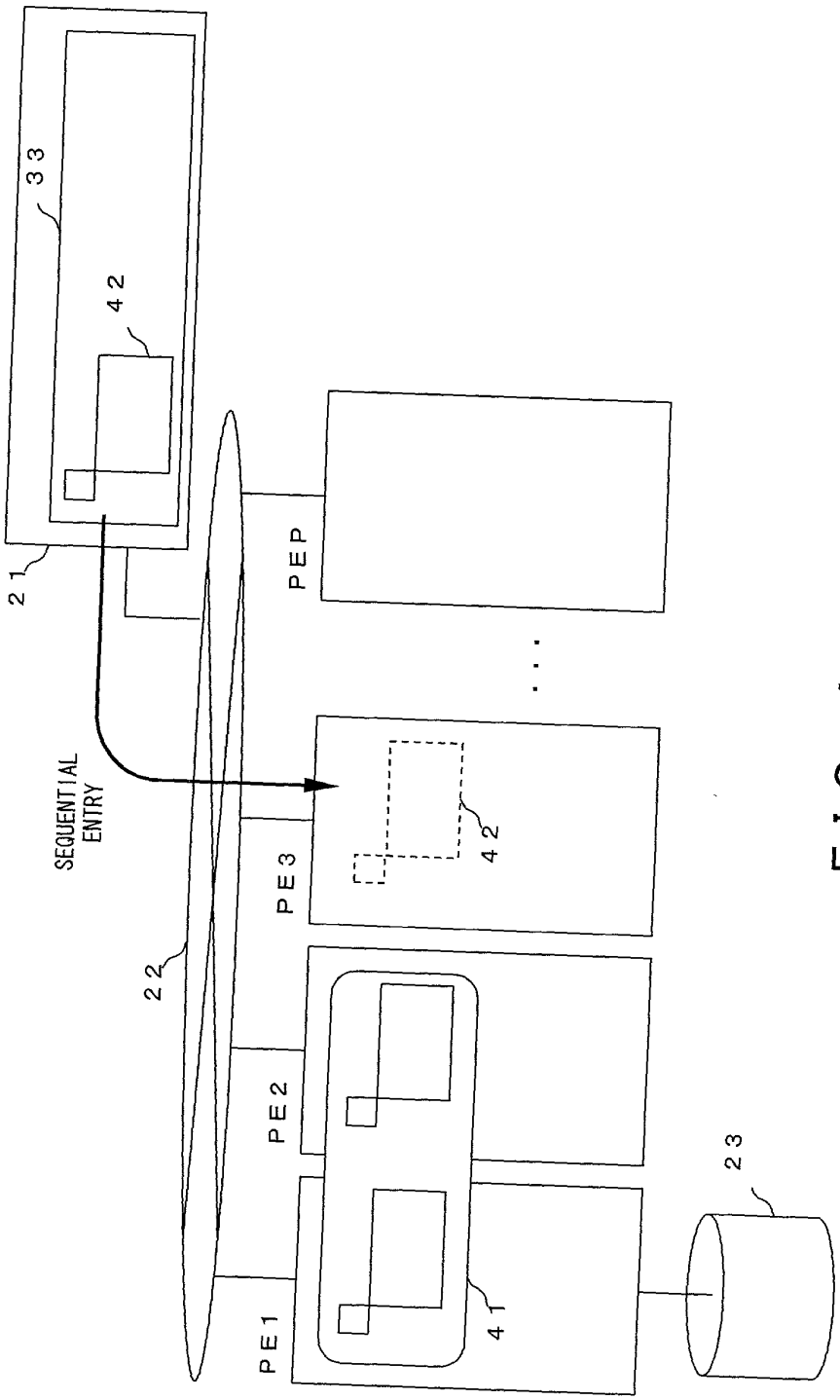

FIG. 4

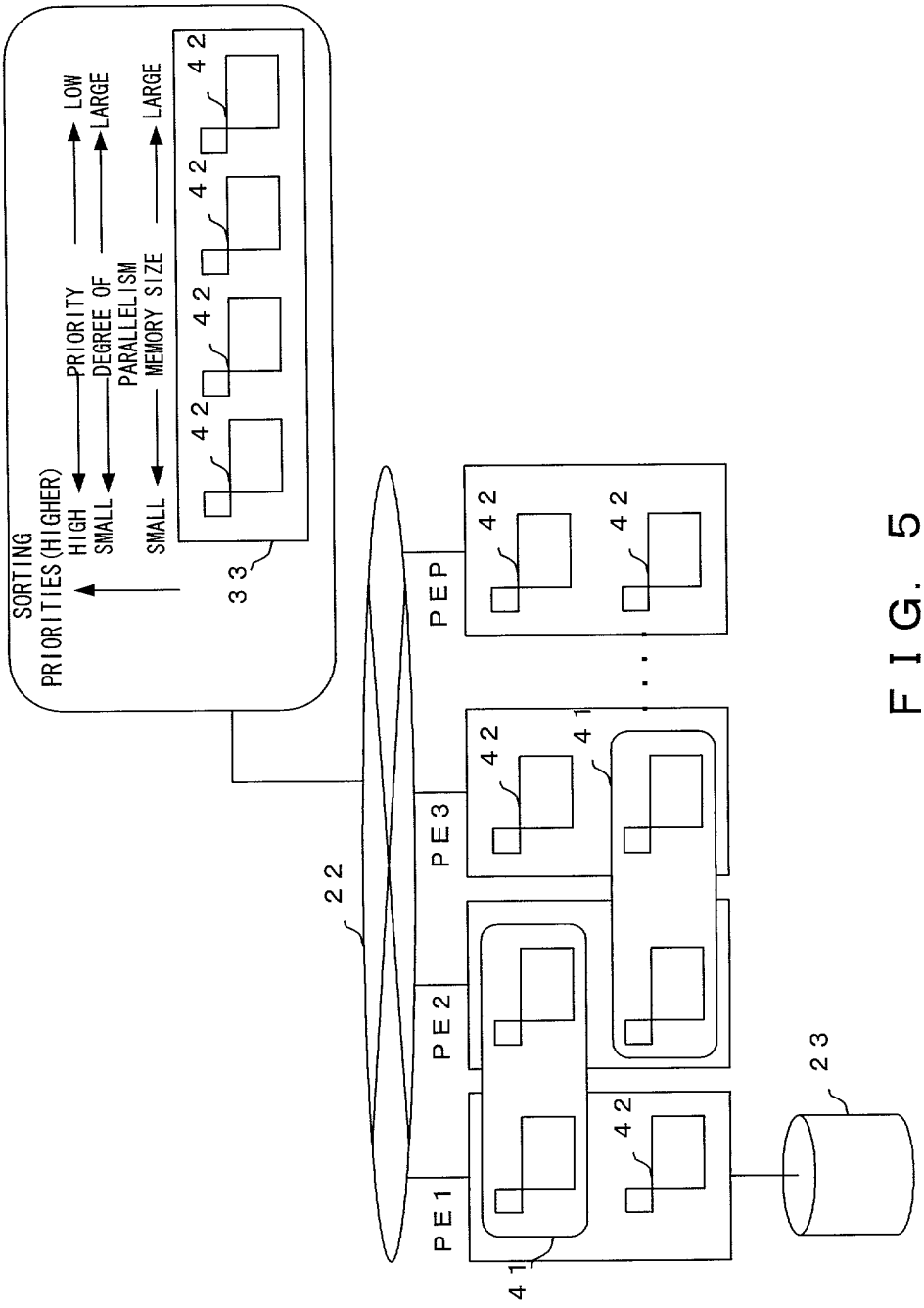
SORTING
PRIORITIES(HIGHER)
HIGH
SMALL
PRIORITY
DEGREE OF PARALLELISM
MEMORY SIZE
SMALL
LARGE
LOW
LARGE
33
42
22
PE1
PE2
PE3
PEP
41
23

FIG. 5

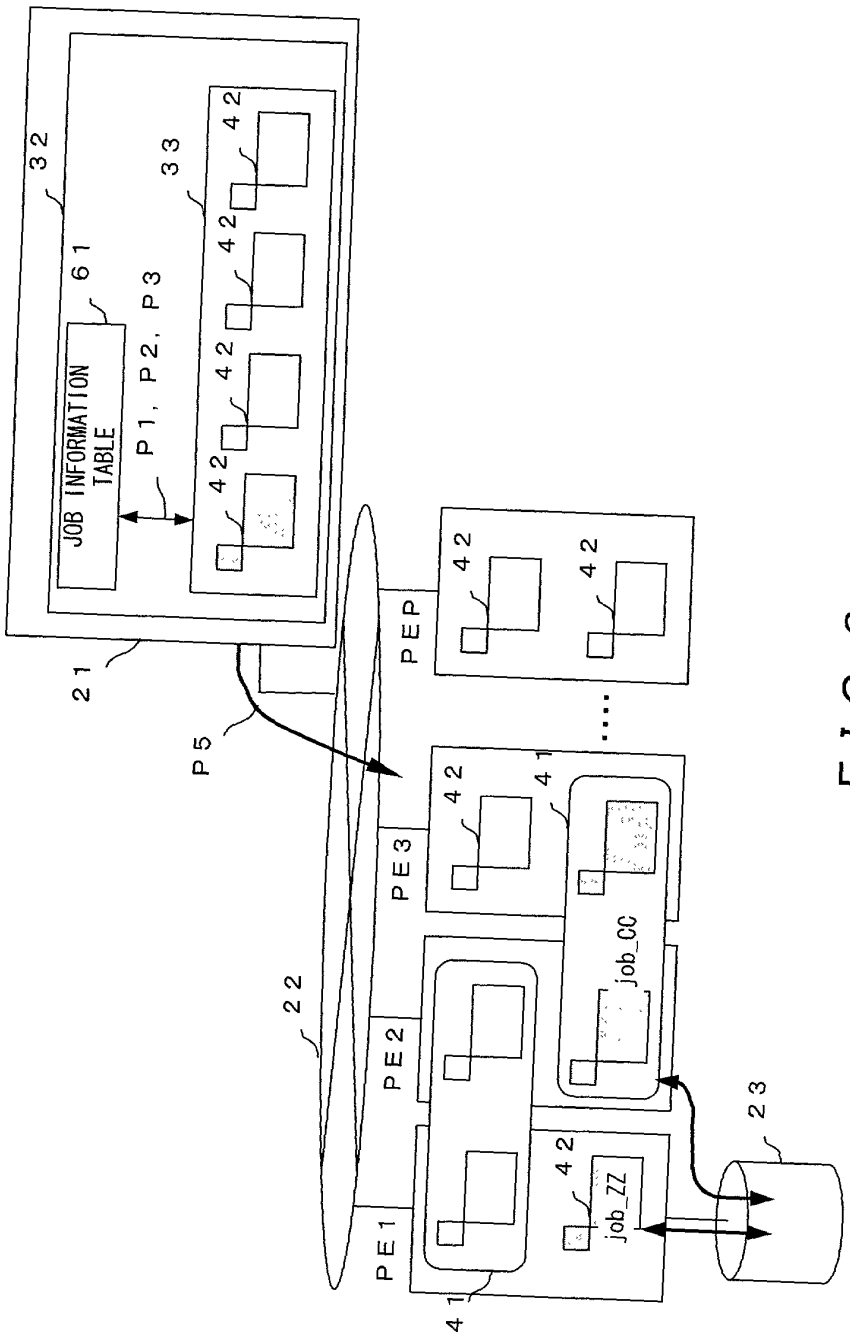
32
61
JOB INFORMATION TABLE
P1, P2, P3
33
42
21
P5
PEP
41
PE3
PE2
PE1
22
job_CC
job_ZZ
23

FIG. 6

FOTETO"ZE6hZ/60

JOB NAME	JOB ID	PRIORITY	DEGREE OF PARALLELISM	MEMORY SIZE	JOB ENTRY TIME	IDLE TIME
job_XX	105	1	6	100	990802083000	0
job_AA	110	1	8	100	990802090000	0
job_BB	107	1	6	50	990802084500	0
job_YY	99	2	8	100	990802080000	0
...						
job_ZZ	100	10	1	50	990802081000	5
job_CC	123	10	2	75	990802081500	10

FIG. 7

SCHEDULING APPARATUS PERFORMING ...
Koichiro Yamashita
Greer, Burns & Crain, Ltd. (Patrick Burns)
Ref. No. 1503.65173
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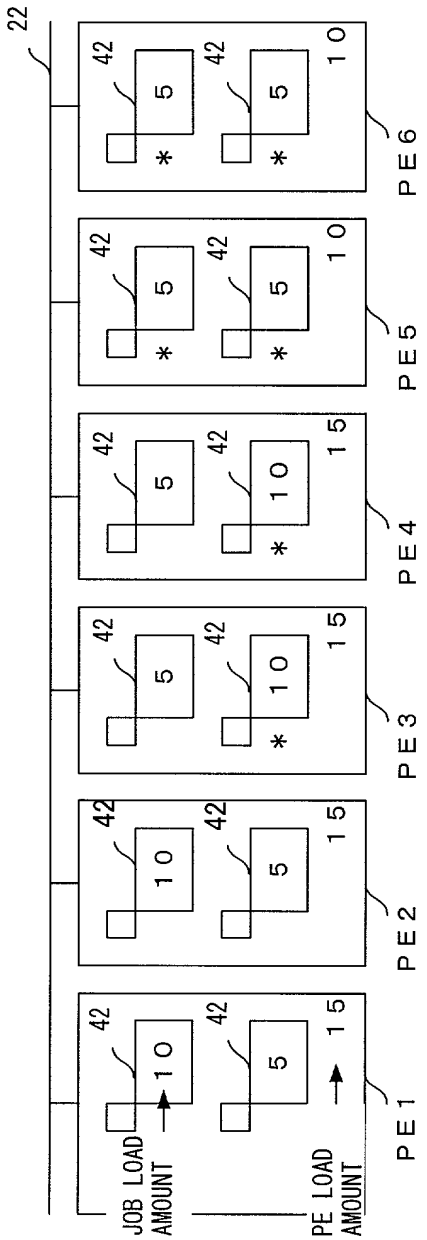
22
42
10
5
15
JOB LOAD AMOUNT
PE LOAD AMOUNT
PE1
PE2
PE3
PE4
PE5
PE6

FIG. 8

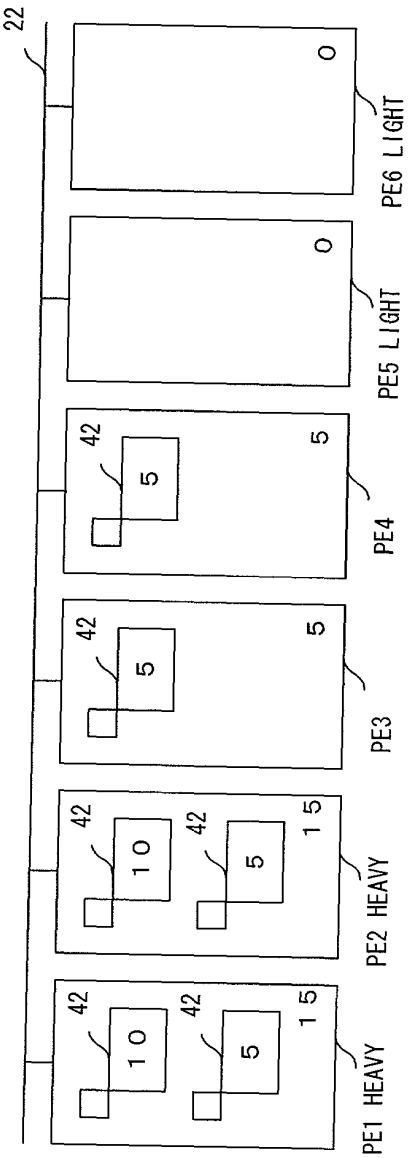
22
0
PE6 LIGHT
0
PE5 LIGHT
42
5
5
PE4
42
5
5
PE3
42
10
42
5
15
PE2 HEAVY
42
10
42
5
15
PE1 HEAVY

FIG. 9

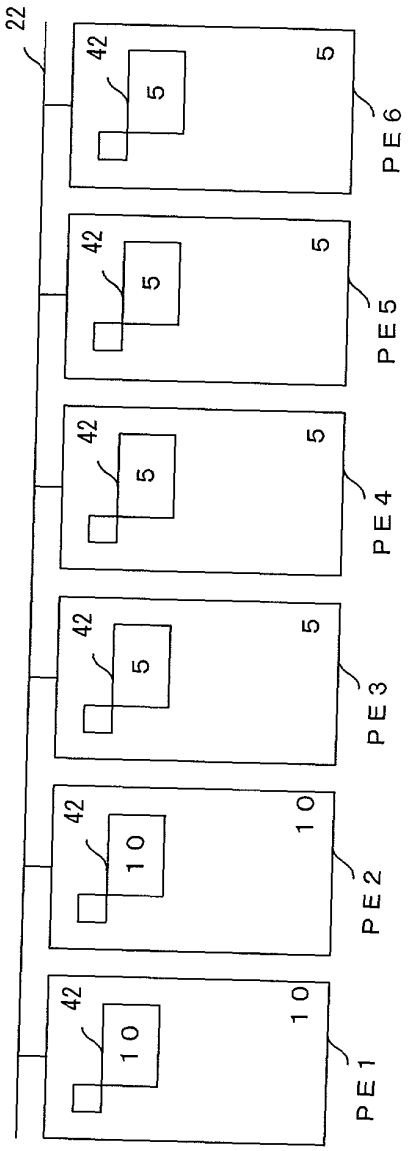

FIG. 10

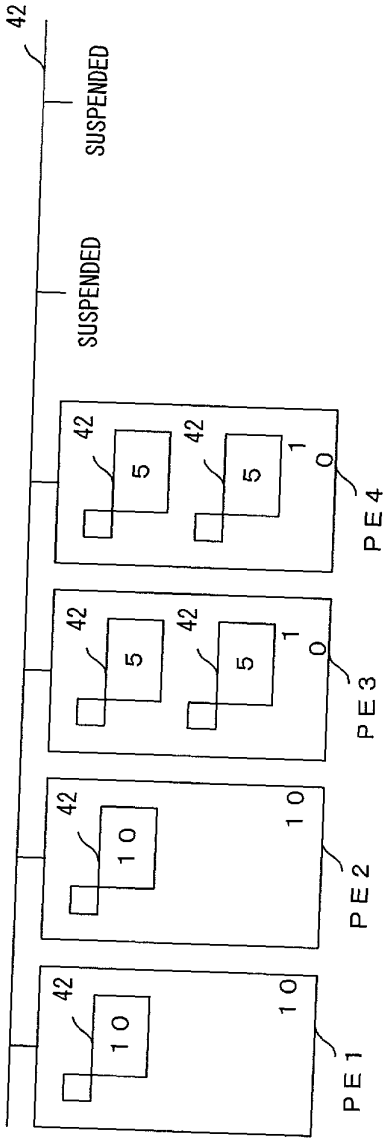
42
SUSPENDED
SUSPENDED
42
5
42
5
1
0
PE4
42
5
42
5
1
0
PE3
42
10
10
PE2
42
10
10
PE1

FIG. 11

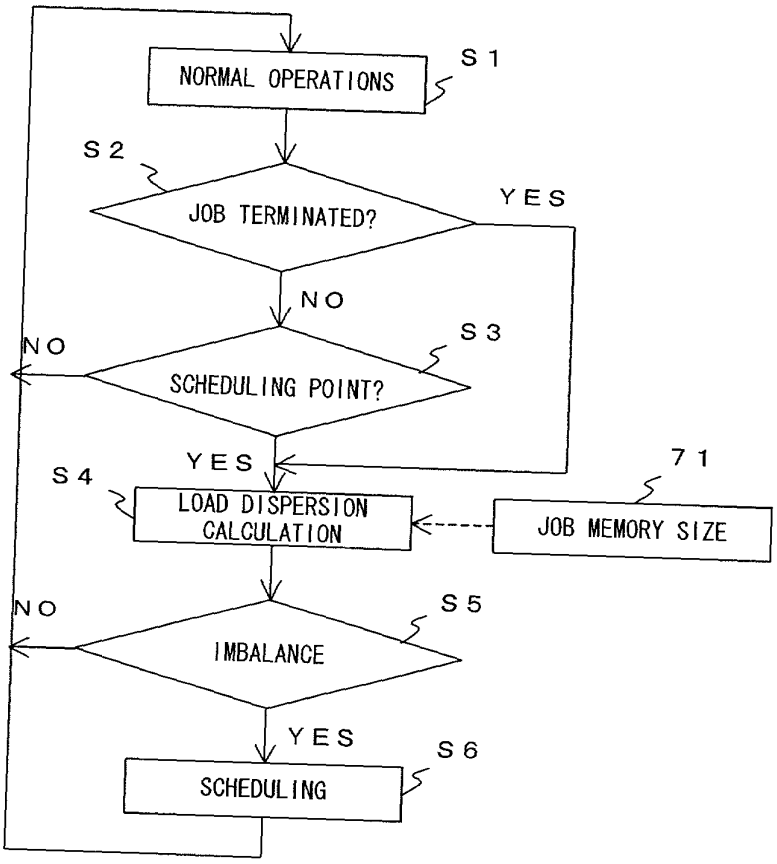
NORMAL OPERATIONS
S1
S2
JOB TERMINATED?
YES
NO
NO
S3
SCHEDULING POINT?
YES
71
S4
LOAD DISPERSION CALCULATION
JOB MEMORY SIZE
NO
S5
IMBALANCE
YES
S6
SCHEDULING

FIG. 12

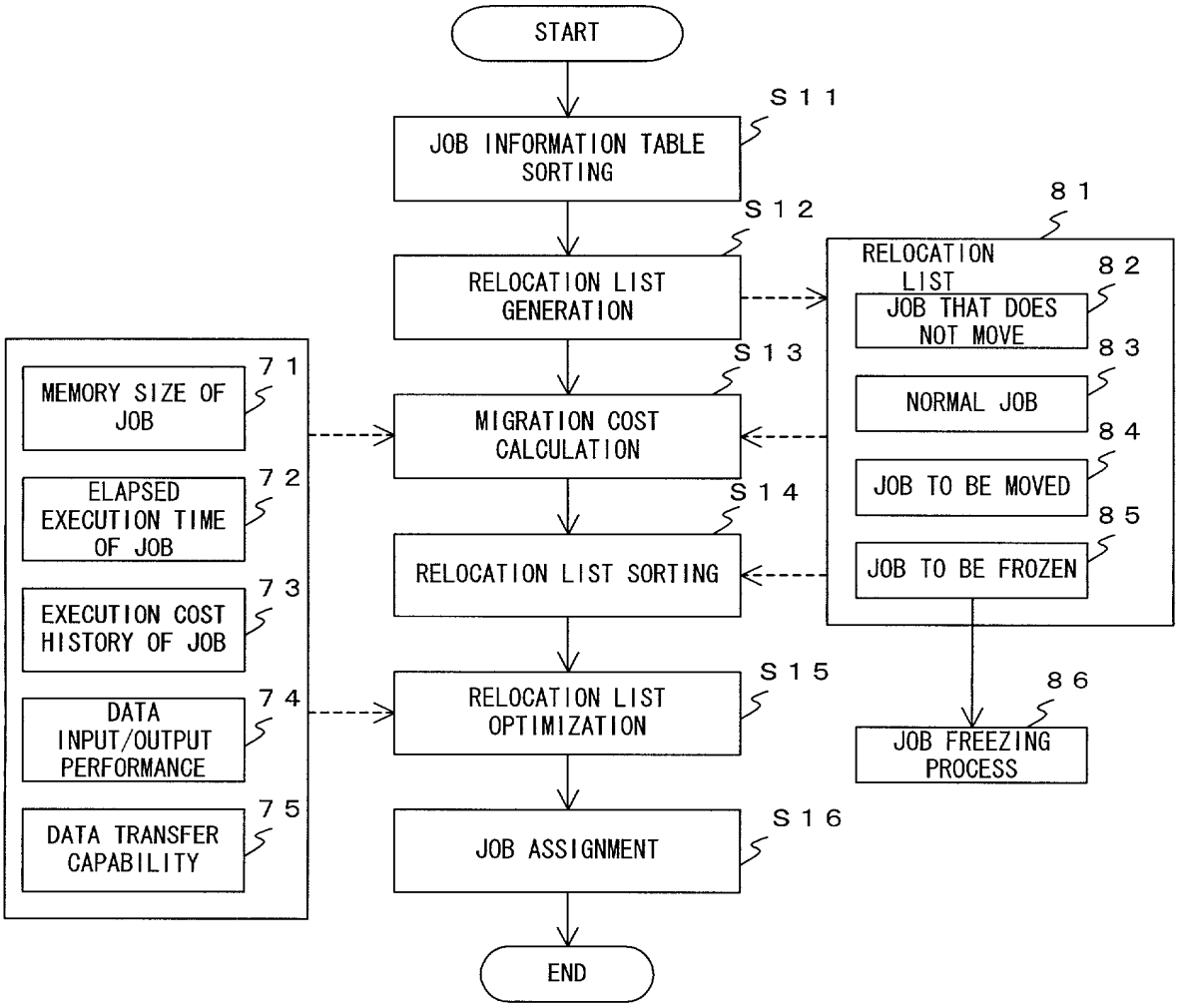
START
S11
JOB INFORMATION TABLE SORTING
S12
RELOCATION LIST GENERATION
S13
MIGRATION COST CALCULATION
S14
RELOCATION LIST SORTING
S15
RELOCATION LIST OPTIMIZATION
S16
JOB ASSIGNMENT
END
71
MEMORY SIZE OF JOB
72
ELAPSED EXECUTION TIME OF JOB
73
EXECUTION COST HISTORY OF JOB
74
DATA INPUT/OUTPUT PERFORMANCE
75
DATA TRANSFER CAPABILITY
81
RELOCATION LIST
82
JOB THAT DOES NOT MOVE
83
NORMAL JOB
84
JOB TO BE MOVED
85
JOB TO BE FROZEN
86
JOB FREEZING PROCESS

FIG. 13

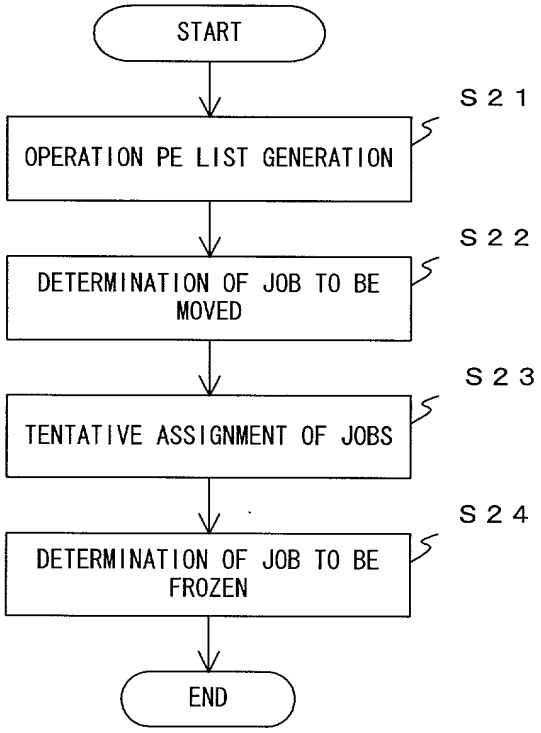
START
S21
OPERATION PE LIST GENERATION
S22
DETERMINATION OF JOB TO BE MOVED
S23
TENTATIVE ASSIGNMENT OF JOBS
S24
DETERMINATION OF JOB TO BE FROZEN
END

FIG. 14

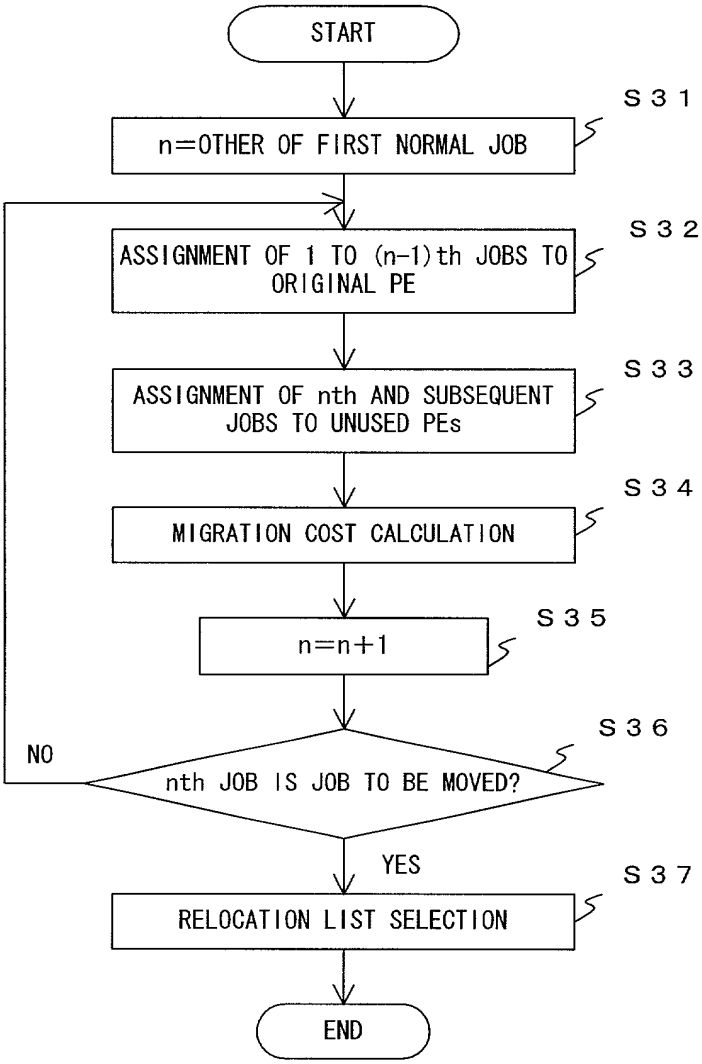
START
S31
n=OTHER OF FIRST NORMAL JOB
S32
ASSIGNMENT OF 1 TO (n-1)th JOBS TO ORIGINAL PE
S33
ASSIGNMENT OF nth AND SUBSEQUENT JOBS TO UNUSED PEs
S34
MIGRATION COST CALCULATION
S35
n=n+1
S36
NO
nth JOB IS JOB TO BE MOVED?
YES
S37
RELOCATION LIST SELECTION
END

FIG. 15

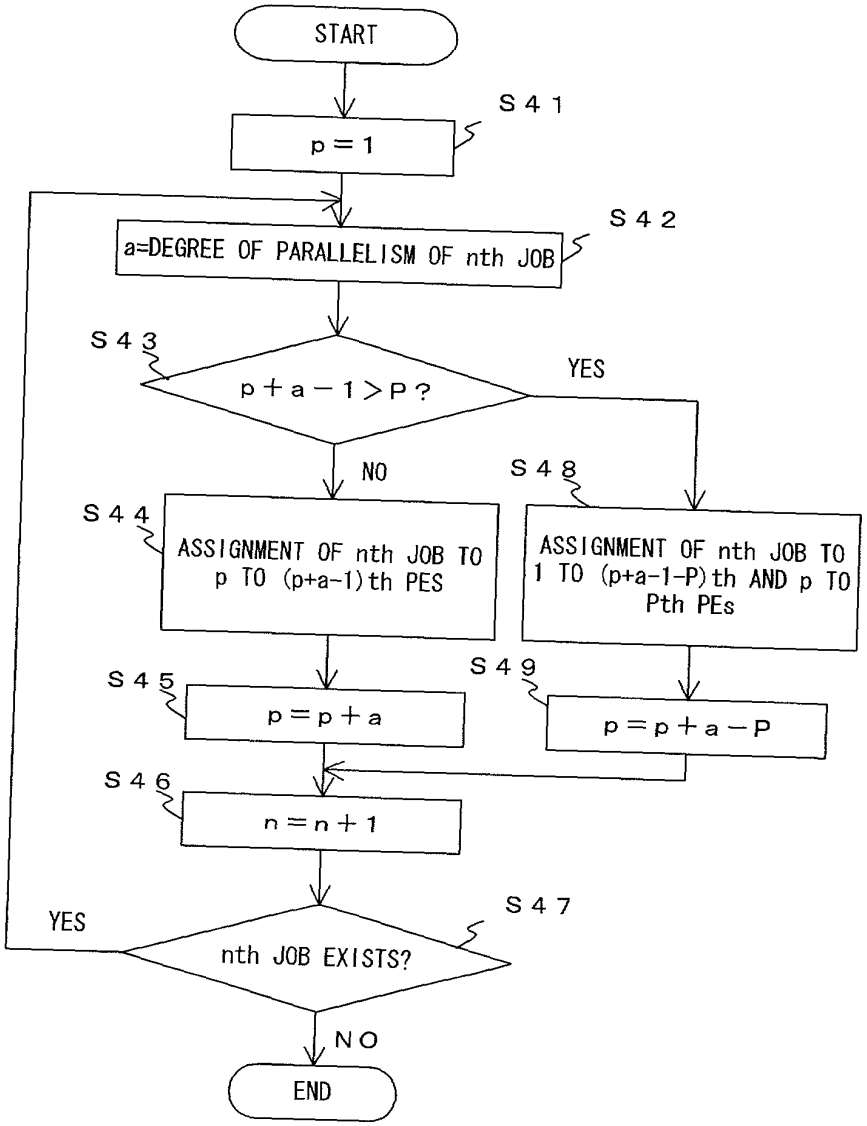
START
S41
p=1
S42
a=DEGREE OF PARALLELISM OF nth JOB
S43
p+a-1>P?
YES
NO
S48
S44
ASSIGNMENT OF nth JOB TO p TO (p+a-1)th PES
ASSIGNMENT OF nth JOB TO 1 TO (p+a-1-P)th AND p TO Pth PEs
S45
p=p+a
S49
p=p+a-P
S46
n=n+1
S47
YES
nth JOB EXISTS?
NO
END

FIG. 16

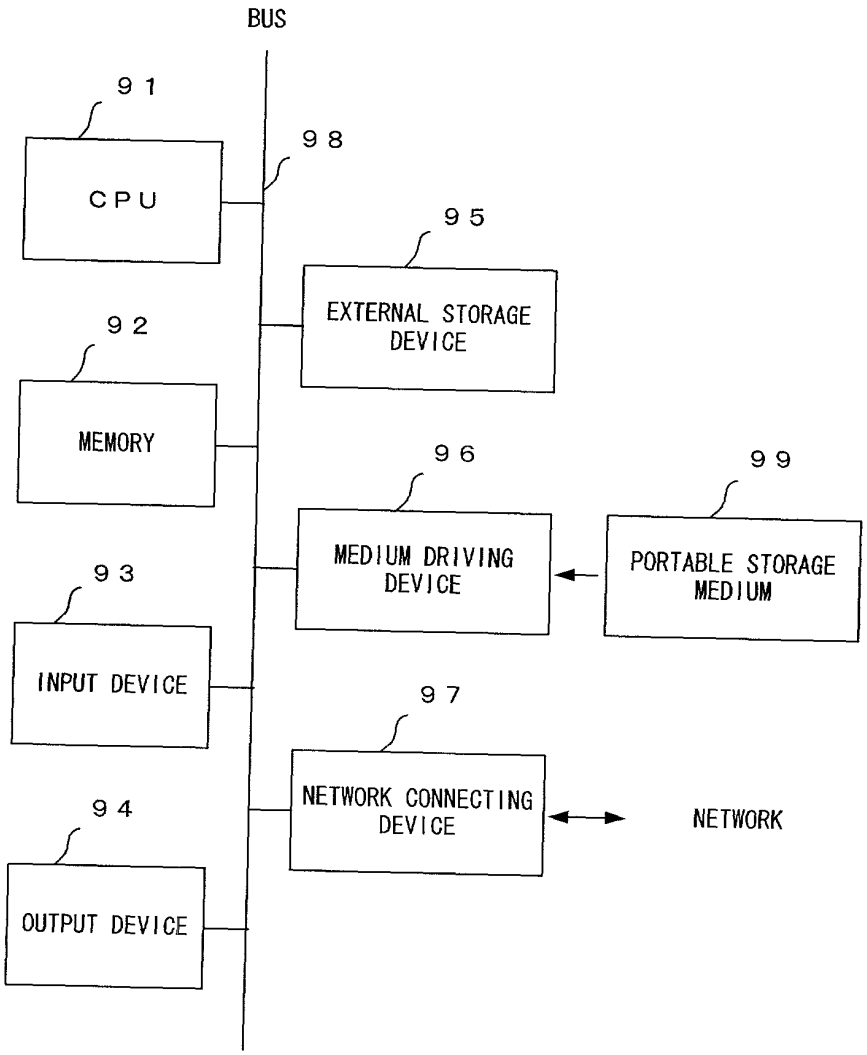
BUS
91
CPU
98
95
EXTERNAL STORAGE DEVICE
92
MEMORY
96
99
MEDIUM DRIVING DEVICE
PORTABLE STORAGE MEDIUM
93
INPUT DEVICE
97
NETWORK CONNECTING DEVICE
NETWORK
94
OUTPUT DEVICE

FIG. 17

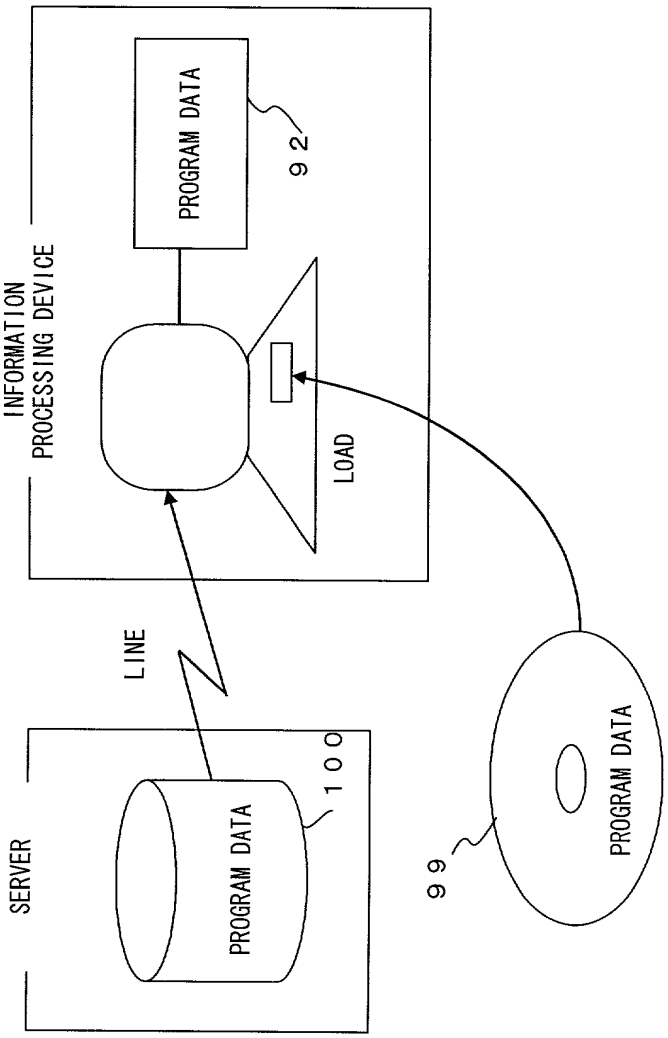
INFORMATION PROCESSING DEVICE
PROGRAM DATA
92
LOAD
LINE
SERVER
PROGRAM DATA
100
99
PROGRAM DATA

FIG. 18

SCHEDULING APPARATUS PERFORMING ...
Koichiro Yamashita
Greer, Burns & Crain, Ltd. (Patrick Burns)
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	SEQUENTIAL EXECUTION	QUEUE SCHEDULING	HIERARCHICAL SCHEDULING		
			$\delta 0=25$	$\delta 0=50$	$\delta 0=75$
TOTAL EXECUTION TIME [sec]	8.56×10^6	6.22×10^6	5.48×10^6	5.62×10^6	5.71×10^6
PERFORMANCE RATIO (SEQUENCE=1)	1	0.72	0.64	0.65	0.66
PERCENTAGE OF MEMORY USE[%]	23	34	52	49	48

FIG. 19

TOKYO 2686260

	SEQUENTIAL EXECUTION	QUEUE SCHEDULING	HIERARCHICAL SCHEDULING		
			$\delta 0=25$	$\delta 0=50$	$\delta 0=75$
TOTAL EXECUTION TIME [sec]	6.12×10^6	5.62×10^6	4.89×10^6	4.10×10^6	5.01×10^6
PERFORMANCE RATIO (SEQUENTIAL = 1)	1	0.91	0.80	0.67	0.82
PERCENTAGE OF MEMORY USE [%]	25	36	55	57	52

FIG. 20

SCHEDULING APPARATUS PERFORMING ...
Koichiro Yamashita
Greer, Burns & Crain, Ltd. (Patrick Burns)
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TOKYO ｴｲｾｲﾎｳｷｮｳ

	SEQUENTIAL EXECUTION	QUEUE SCHEDULING	HIERARCHICAL SCHEDULING		
			$\delta 0=25$	$\delta 0=50$	$\delta 0=75$
TOTAL EXECUTION TIME [sec]	5.68×10^6	5.49×10^6	5.12×10^6	5.03×10^6	4.78×10^6
PERFORMANCE RATIO (SEQUENTIAL=1)	1	0.97	0.90	0.88	0.84
PERCENTAGE OF MEMORY USE [%]	21	33	48	45	50

FIG. 21

SCHEDULING APPARATUS PERFORMING ...
Koichiro Yamashita
Greer, Burns & Crain, Ltd. (Patrick Burns)
Ref. No. 1503.65173
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(312) 360 0080